MISSISSIPPI HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE (HSEES)

Cumulative Report
1995 - 1997

Mississippi State Department of Health

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Executive Summary

Since January 1, 1995, the Mississippi State Department of Health (MSDH) has participated in a project known as the Hazardous Substances Emergency Events Surveillance (HSEES). The project, which currently includes fifteen states, is funded by the Agency for Toxic Substances and Disease Registry (ATSDR) and collects data about emergency spills involving non-petroleum hazardous substances. The goal of the HSEES project is to reduce morbidity (injury) and mortality (death) resulting from hazardous substances emergency events by identifying risk factors using the spill data and by developing risk reduction strategies.

From January 1, 1995 through December 31, 1997, project staff reviewed 2,454 actual and threatened spills/air releases reported in Mississippi and identified 352 events (14.3%) which involved non-petroleum substances and met study criteria. These spills and air releases were investigated through telephone and written inquiries to appropriate sources including state environmental agencies, state emergency management agencies, local fire and police departments, civil defense/emergency planning agencies, hospitals, and the industries involved. Staff collected data using a 68-question survey developed by ATSDR.

The 352 events which met the project criteria were entered into the database. Sixty-eight percent (n = 241) occurred at fixed facilities and the remaining 32% (n = 111) occurred during transport. Of the transportation events, 88 events (79%) involved a motor vehicle (truck, van, tractor or automobile). The chemicals most frequently released in reported events in descending order were ammonia, chlorine, paint or coating NOS, benzene, titanium tetrachloride and sulfuric acid. Most events (n = 326, 93%) involved a single hazardous substance, six percent (n = 22) involved two hazardous substances and only one percent (n = 4) involved three to seven hazardous substances. Evacuations were ordered in 51 events and resulted in 15,181 people leaving their home or work as a direct result of a hazardous substance release. The chemicals most frequently associated with evacuations were ammonia, multi-chemical releases, chlorine, Freon NOS, hydrochloric acid and Malathion.

A total of 327 people were injured in 41 events. The most common injuries were respiratory irritation, nausea or vomiting, headache, dizziness or other central nervous system symptoms, and eye irritation. The chemicals most frequently associated with victims were ammonia, multi-chemical releases, chlorine and formaldehyde. Fifty percent (n = 162) of the injured were employees. Most injured people (88%) were transported to the hospital and released after treatment. Five fatalities were recorded; all were trauma related from transportation events.

Hazardous Substances Emergency Events Surveillance

Introduction

The Hazardous Substance Emergency Events Surveillance (HSEES) system is an on-going, state-based project funded by the Agency for Toxic Substances and Disease Registry (ATSDR) to describe the public health consequences of spills involving non-petroleum hazardous substances. Mississippi joined the project, which now includes 15 states, in 1995.

The goal of the project is to reduce morbidity (injury) and mortality (death) resulting from hazardous substances emergency events by identifying risk factors in the spill data and providing the information to appropriate audiences such as health and safety officers or emergency responders. Measures to reduce morbidity and mortality may include improved employee training, improved use of appropriate personal protective equipment, improvements in equipment maintenance or, in some cases, a process change. The surveillance objectives are to:

- describe the distribution and characteristics of hazardous substances emergencies in Mississippi.
- describe the morbidity and mortality experienced by employees, responders and the general public that result from hazardous substances emergency events.
- identify risk factors associated with morbidity and mortality from the release of hazardous substances.
- identify prevention strategies that might reduce future morbidity and mortality associated with hazardous substance releases.

This report summarizes all project data collected in Mississippi for the period of January 1, 1995, through December 31, 1997.

Methods

Definition of a Reportable Event

For the HSEES project, a reportable event is defined as an uncontrolled or illegal release of hazardous substances (excluding petroleum products) that needs to be removed, cleaned up or neutralized according to federal, state or local law.

A threatened release which leads to a public health action such as an evacuation or traffic re-routing also qualifies for inclusion in the system

Definition of Fixed Facility and Transportation Events

Fixed-facility events are those which occur outdoors or inside the building on the premises

of a facility or site. Some examples of fixed facilities are industrial sites, businesses, manufacturing plants, farms, schools, hospitals and private residences. Transportation events involve ground, rail, water, air or pipline transport and occur outside the boundaries of a fixed facility.

Data Collection Methods

Data are collected using a 68-question survey form developed and provided by ATSDR. The categories of information collected during an investigation include the following:

- chemical name and quantity released;
- time, date and location of events;
- type of release (e.g., spill, air emission, fire, explosion, etc.) and factors contributing to the release (e.g., equipment failure, operator error, improper mixing, overfill, etc.);
- injury information including victim category (employee, responder, general public),severity of injury, injury type, gender, age, distance from release and personal protective equipment used;
- number of employees, responders or general public decontaminated;
- estimated size of the potentially-exposed residential population and estimated number of people at work within 1/4, ½, and one mile radii of the release;
- evacuation and in-place sheltering activities; and
- control actions and type of emergency response plan used.

Each event is given a unique record identification number for tracking purposes.

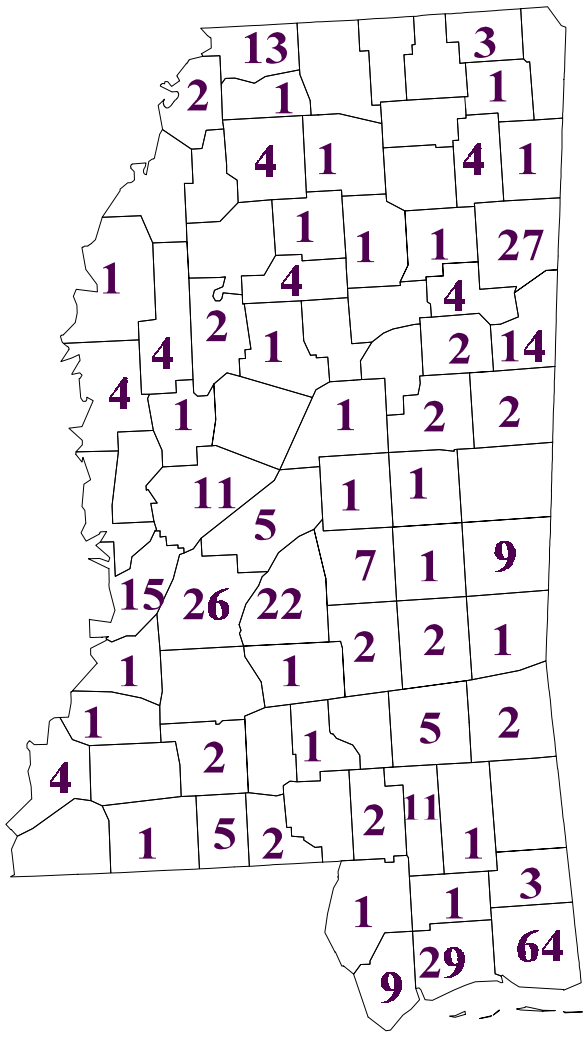
The two primary sources used to collect information in Mississippi about the nature and public health impact of hazardous substances emergency events are the Mississippi Department of Environmental Quality Emergency Services Division and the Mississippi Emergency Management Agency. Other sources include local fire and police departments, civil defense/emergency planning agencies, and newspaper, radio and television reports. Each event is investigated thoroughly and as quickly as possible by telephone and written inquires to the previous mentioned sources as well emergency medical technicians, industry, safety or environmental personnel, hospital staff, plant managers, employees, and private citizens.

For the analyses, the substances released were categorized into 11 groups. The category “mixtures” consisted of mixtures of substances from different categories, and the category “other” consisted of substances that could not be placed in one of the other 10 substance categories. The category “other inorganic substances” comprised all inorganic substances except for acids, bases, ammonia, and chlorine.

Results

In the first three years, the MSDH received information on or identified 2,454 incidents involving releases of potentially hazardous substances. Of these, 1,793 (73%) did not meet the definition for entry into the HSEES system primarily due to the release being a petroleum product; 309 events (13%) met the case definition but occurred in a contiguous state near the border of Mississippi. The remaining 352 events (14%) were documented as hazardous substancs events in the Mississippi HSEES. Two hundred forty-one events (68%) occurred at fixed facilities, while 111 events (32%) were classified as transportation-related events. Events occurred in 59 of Mississippi's 82 counties (Figure 1). The top five counties experiencing events were: Jackson (n=64), Harrison (n=29), Monroe (n=27), Hinds (n=26), and Rankin (n=22).

Figure 1. - Distribution of events, by county, Mississippi HSEES, 1995 - 1997.



Of the 241 fixed-facility events, 29% involved piping; 20% involved storage above ground; 14% involved a process vessel, which is the reaction chamber where chemicals are processed, 9% involved material handling, and 25% involved a type of processing reported as "other" which included ancillary processing equipment, transformers, incinerators, etc. (Figure 2). The remaining events involved a variety of areas or the areas were unknown. Of the 111 transportation-related events, 79% occurred during ground transport (for example, truck, van, or tractor) and 14% involved transport by rail (Figure 3). The remaining transportation-related events involved water, air, or pipeline transport.

Factors that contributed to fixed-facility events are represented in Figure 4. One hundred ninety-three of the 241 fixed-facility events identified a contributing factor. (Information on contributing factors was not collected until mid-1995.) Of these, 119 (62%) involved equipment failure as a contributing factor to the occurrence of the event and 38 (20%) involved operator error. The remaining factors were identified as improper filling/overfill (3%) and other (15%) including factors such as system/process upset, system start up and shutdown, power failure/electrical problems, etc.

Ninety-three percent of all events involved the release of only one substance (Table 1). Two substances were released in approximately 6% of the events, and the remaining events involved the release of more than two substances.

Substances

HSEES substances were grouped into 11 categories. Of the 11 categories, "other" (20%), other inorganic substances (19%), ammonia (17%), and VOCs (15%) were the categories of substances most commonly released in fixed-facility events (Table 2). In transportation-related events, "other" (38%), other inorganic substances (15%), acids (12%), and pesticides (10%) were the most frequently released. The top ten chemicals most frequently reported to Mississippi HSEES for the period 1995 - 1997 are listed in Appendix A.

Victims

Forty-one of the 352 events resulted in 327 victims (12% of all events). Of the 41 events, 54% involved only one victim, and 66% involved either one or two victims (Table 3). Eighty-four percent were injured in fixed-facility events. One hundred ninety-two (59%) of the injured were female.

The substances released most often were not necessarily the most likely to result in victims (Table 4). For example, substances identified in the category "other" were released during 99 events (26% of all events); however, only 15 (15%) of these events resulted in injury. Although pesticides were released in only 19 events (5% of all events) and "mixtures across substance categories" were released in only 10 events (3% of all events), 21% and 20% of these events respectively resulted in injury. The top chemicals spilled for events where people were injured are listed in Appendix B.

The population groups most often injured were employees (50%) and the general public (43%) (Table 5). In the 41 events with victims, 162 employees, 141 members of the general public (including students) and 24 responders suffered one or more adverse health effects as a result of hazardous substance releases. The 24 responders consisted of 12 police, 7 professional firefighters, 4 emergency medical technicians (EMT), and one responder of unknown affiliation.

The types of injuries sustained by victims are shown in Table 6. The 327 victims sustained a total of 657 injuries. Some victims had more than one injury. The most frequently reported injuries in fixed-facility events were respiratory irritation (25%), headache (23%), nausea (22%) and dizziness or other central nervous system symptoms (16%). In transportation-related events, nausea (23%), trauma (18%), respiratory irritation (14%) and dizziness or other central nervous system symptoms (13%) were reported most frequently. All trauma injuries occurred during transportation events. The trauma might have been caused by the sequence of events (for example, a motor vehicle crash) leading to the release of a hazardous substance and not necessarily by exposure to the hazardous substance itself.

Table 7 shows that among the 327 persons injured, 287 (88%) were transported to a hospital for evaluation and treatment, but were not admitted. Of the remaining 40 persons, 15 (5%) were transported to, treated and admitted to a hospital; 8 each (2%) were transported to a hospital for observation, but received no treatment or were seen by private physicians; two each (<1%) were treated on scene or reported injuries to poison control and were advised to seek medical assistance; and five (1.5%) died. The five deaths were all trauma related from transportation events. Among the victims, 22 of 327 (6.7%) were wearing some type of protective equipment.

Evacuations

Evacuations were ordered in 51 events and resulted in 15,181 people leaving their home or work as a direct result of a hazardous substance release. Of the 51 events requiring evacuation, 23 (46%) involved the evacuation of a building or the affected part of a building where the release occurred. Thirteen (26%) involved evacuating a defined circular area around an event, eight (16%) were based on actual or anticipated downwind dispersion, 3 (<1%) were based on a circular area and anticipated downwind dispersion, and 3 (<1%) were ordered without criteria. Information on evacuated area was missing for one event. The top chemicals spilled for events where an evacuation was ordered are listed in Appendix C.

Summary of Results, 1995-1997

The number of events, substances released, events with victims, and deaths for 1995 - 1997 are depicted in Table 8. In the three years of data collection, most events have involved a single substance and have occurred at fixed facilities. Respiratory irritation was the most common injury to victims. All fatalities occurred as a result of trauma from transportation-related events, and all were the result of the accident and not a result of the substance released. Employees were the most commonly reported victims of emergency events.

Findings from HSEES data collection efforts can provide useful information regarding risk factors related to the occurrence of emergency events and the associated morbidity and mortality. This information can be used to develop training and health education programs for persons involved in hazardous substances emergency response and planning and also for manufacturers and transporters of hazardous materials.

Appendix A - Top Chemicals Spilled, Mississippi HSEES

Years 1995 - 1997

HSEES Standard Chemical Name	Frequency	Percent
Ammonia	45	11.6
Chlorine	28	7.2
Paint or Coating NOS	14	3.6
Benzene NOS	14	3.6
Titanium Tetrachloride	13	3.4
Sulfuric Acid	13	3.4
Hydrochloric Acid	8	2.1
Formaldehyde	7	1.8
Sulfur Dioxide	7	1.8
Hydrogen Sulfide (tie)	6	1.5
Ammonia Nitrate (tie)	6	1.5
Sodium Hydroxide (tie)	6	1.5

Appendix B - Top Chemicals Spilled
in Events Where People Were Injured, Mississippi HSEES

Years 1995 - 1997

HSEES Standard Chemical Name	Frequency	Percent
Ammonia	5	12.2
Multichemical Release	4	9.8
Chlorine	2	4.9
Formaldehyde	2	4.9

Appendix C - Top Chemicals Spilled
in Events Where an Evacuation was Ordered, Mississippi HSEES

Years 1995 - 1997

HSEES Standard Chemical Name	Frequency	Percent
Ammonia	14	27.5
Multichemical Release	7	13.7
Chlorine	4	7.8
Freon NOS	3	5.9
Hydrochloric Acid	2	3.9
Malathion	2	3.9

Figure 2. - Areas of fixed facilities involved in events, Mississippi HSEES, 1995 - 1997.

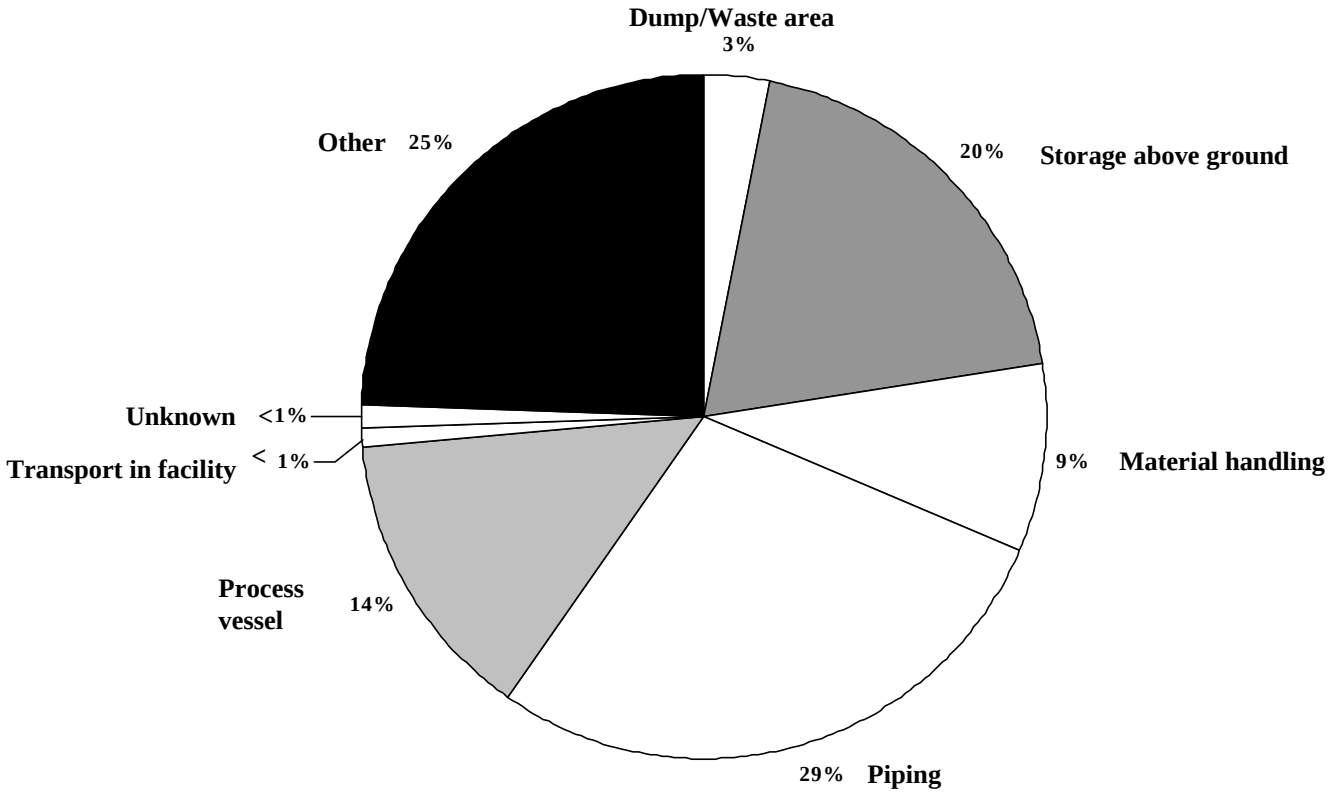


Figure 3. - Distribution of transportation-related events, by type of transport, Mississippi HSEES, 1995 - 1997.

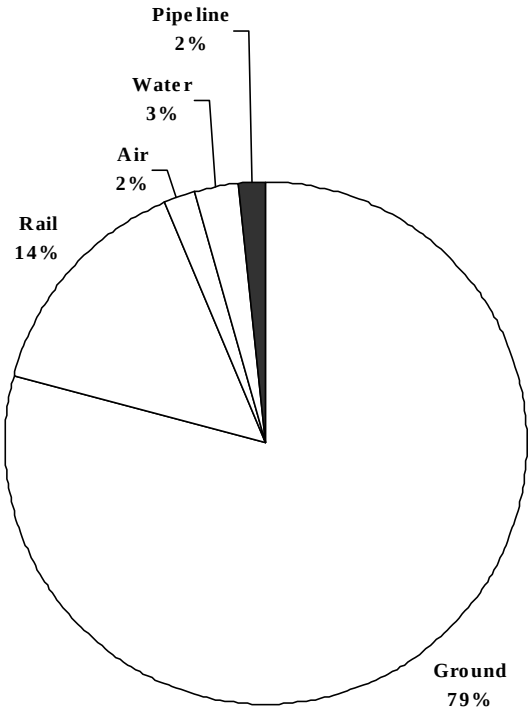


Figure 4. - Factors reported as contributing to the occurrence of fixed-facility events, Mississippi HSEES, 1995 - 1997.